

1
"Made available under NASA sponsorship
in the interest of early and wide dis-
semination of Earth Resources Survey
Program information and without liability
for any use made thereof."

E7.3 10948
CR-133624

ALL DIGITAL PRECISION PROCESSING OF ERTS IMAGES

Ralph Bernstein
IBM Corporation
Gaithersburg, Maryland 20760

7 September 1973

Type I Progress Report for Period 1 July - 31 August 1973

Prepared for:

NASA
Goddard Space Flight Center
Greenbelt, Maryland 20771

IBM Corporation
Federal Systems Center
18100 Frederick Pike
Gaithersburg, Maryland 20760

(E73-10948) ALL DIGITAL PRECISION
PROCESSING OF ERTS IMAGES Progress
Report, 1 Jul. - 31 Aug. 1973
(International Business Machines Corp.)
4 p HC \$3.00

N73-30290

CSCL 05B G3/13

Unclas
00948

Type I Progress Report
ERTS-I

- a. Title: All Digital Precision Processing of ERTS Images
- b. GSFC ID Number of P.I.: PR 514
- c. Statement and explanation of any problems that are impeding the progress of the investigation:

None.
- d. Discussion of the accomplishments during the reporting period:
The MSS geometric and radiometric correction programs have been brought up to the latest design level.

Annotation routines which add textual information, registration marks, scale data (statute miles and kilometer scales), and a gray scale wedge to the borders of the images have been incorporated in the system. Software to generate UTM and latitude/longitude tick marks around the images has been tested successfully but has not yet been integrated with the other software.

A radiometric correction based on pre-launch Hovis sphere data was applied to RBV CCT data to remove shading errors (band 1 of scene 1002-18134 Monterey, California). The uncorrected and corrected data were recorded on film and evaluated. Preliminary examination of the film produced the following observations:

- 1) No patterns or tonal discontinuities resulting from the use of zones of constant correction parameters are visible.
- 2) Significant ground detail is visible in the radiometrically corrected areas which are either nearly all white or black in the uncorrected image.

Film recordings of the corrected and uncorrected image data have been given to Mr. Oscar Weinstein of NASA for a more thorough evaluation.

To predict mapping accuracies for the digitally corrected RBV data, APL programs analogous to those developed for the MSS geometric correction were developed. When they were applied to bands 1 and 3 of scene 1002-18134, the following predicted mapping accuracies were obtained:

<u>Band</u>	<u>No. of GCP's</u>	<u>Max. Error</u>	<u>RMS Error</u>
1	9	64.9m	37.1m
3	8	68.0m	42.1m

It should be noted that these figures represent errors in the geometric mapping function only and are smaller than expected errors in final output products (due to film shrinkage, recorder errors, and measurement errors).

The MSS geometric error analysis has been completed. The results for a 5 x 5 array of points spanning 90% of the image are summarized in the following table:

		<u>Location Errors (Metres)</u>	
		<u>Relative</u>	<u>Absolute</u>
Digital Tapes	Max.	124.1	127.1
	RMS	66.9	78.1
Film Images	Max.	133.0	135.8
	RMS	82.2	91.6

e. Discussion of accomplishments planned for next reporting period:

It is anticipated that the following objectives will be accomplished during the next reporting period:

- o Geometrically and radiometrically corrected and annotated MSS images of the Monterey, Phoenix, and Chesapeake test sites will be produced and recorded on film.
- o These images will be submitted to USGS and others for independent mapping accuracy, resolution, and quality evaluation.
- o The programs for correcting RBV images will be brought to a final design level.
- o RBV images of the Monterey test site will be geometrically and radiometrically corrected, annotated, and recorded on film.
- o The SSDA analysis will be completed.
- o The alternate configuration analysis will be completed.

If the additional tasks described in our recent proposal for expansion of this contract are approved, then it is anticipated that the following objectives will also be accomplished:

- o The alternative configuration analysis will be expanded to include man-machine interaction for ground control point processing and the consideration of special purpose hardware.
- o A comparison of three alternative techniques for assigning video values to the points of the output image space will be made.
- f. Discussion of significant scientific results and their relationship to practical applications or operational problems including estimates of the cost benefits of any significant results (To be prepared in scientific abstract form of 200 words or less):

None

- g. A listing of published articles, and/or papers, pre-prints, in-house reports, abstracts of talks, that were released during the reporting period:

Results of Precision Processing (Scene Correction) of ERTS-1 Images Using Digital Image Processing Techniques, Paper I7 Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1, NASA SP 327, Vol I, 1973.

- h. Recommendations concerning practical changes in operations, additional investigative effort, correlation of effort and/or results as related to a maximum utilization of the ERTS system.

A proposal to expand this investigation by the addition of two tasks was submitted July 5, 1973. The additional effort would augment the configuration analysis through the investigation of man-machine interaction for ground control point processing and the consideration of special purpose hardware. It would also permit a comparison of three alternative techniques for assigning video values to the points of the output image space.

It is recommended that this proposal be acted upon so that this investigation will be conducted and included in the on-going effort.

- i. A listing of any changes in Standing Order Forms:

None

- j. ERTS Image Descriptor forms:

None

- k. Listing of Data Request forms submitted to Goddard Space Flight Center/NDPF during the reporting period:

None

- l. Status of Data Collection Platforms (if applicable):

N/A